5.8 ANTI-COINCIDENCE COUNTERS (ACC)

The ACC is a single layer of scintillating panels that surround the AMS-02 Silicon Tracker inside the inner bore of the superconducting magnet (Figure 5.8-1). The ACC identifies particles that enter or exit the Tracker through the side, detecting particles that have not cleanly traversed the Tracker. The ACC provides a means of rejecting particles that may confuse the charge determination if they leave "hits" in the Tracker close to the tracks of interest.

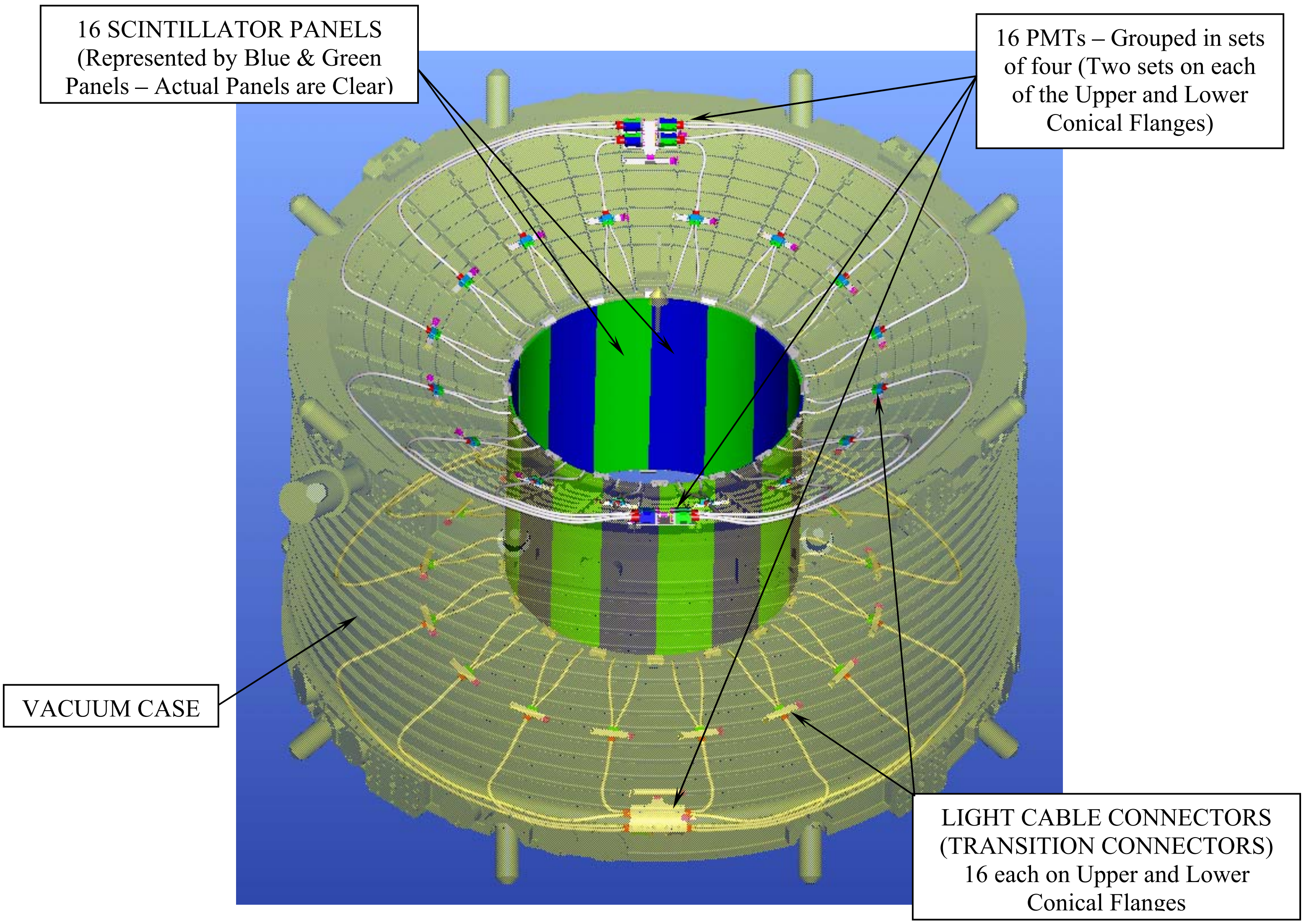

Figure 5.8-1 ACC Location Within the Inner Cylinder of the Vacuum Case

The ACC scintillating panels are fitted between the Tracker shell and the inner cylinder of the Vacuum Case, which contains the Cryomagnet system. The ACC is composed of sixteen interlocking panels fabricated from BICRON BC414 (Figures 5.8-2 and 5.8-3). The panels are 8 mm thick (as opposed to the 10 mm panels used for the AMS-01 ACC) and are milled with tongue and groove interfaces along their vertical edges to connect adjacent panels. This provides hermetic coverage for the ACC detection function around the Silicon Tracker. The panels are supported by a 33.46 in (850 mm) tall x .78 in (1086.7) diameter x 0.047 in (1.2 mm) thick M40J/CE Carbon Fiber Composite (CFC) Support Cylinder (Figure 5.8-4).

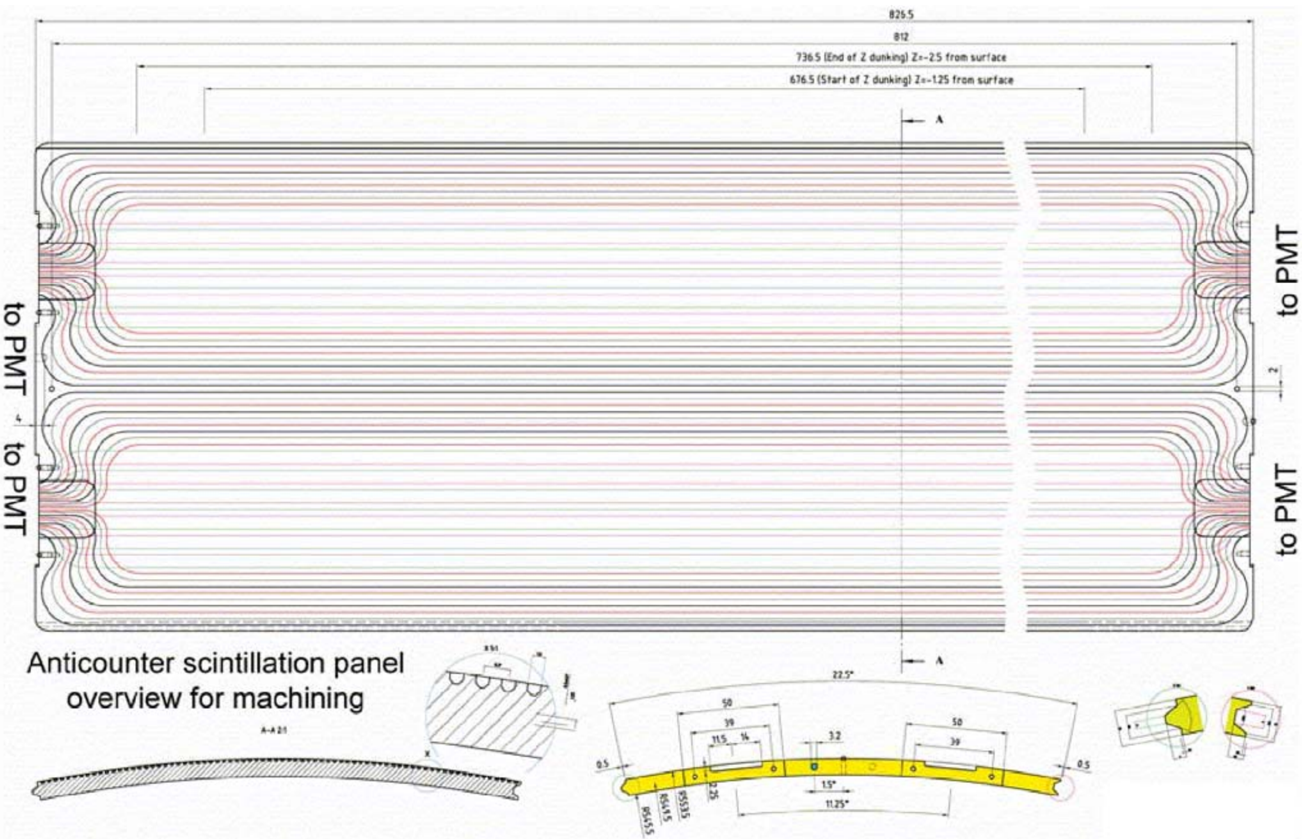

Figure 5.8-2 Design Details of an ACC Scintillator Panel

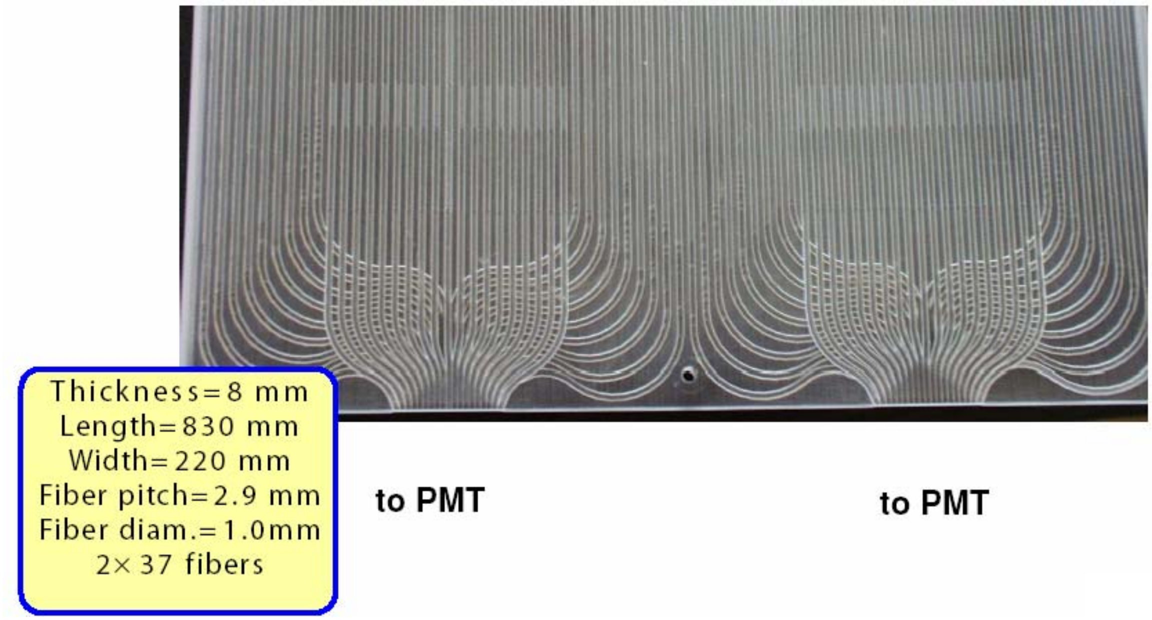

Figure 5.8-3 Finished End of an ACC Scintillator Panel

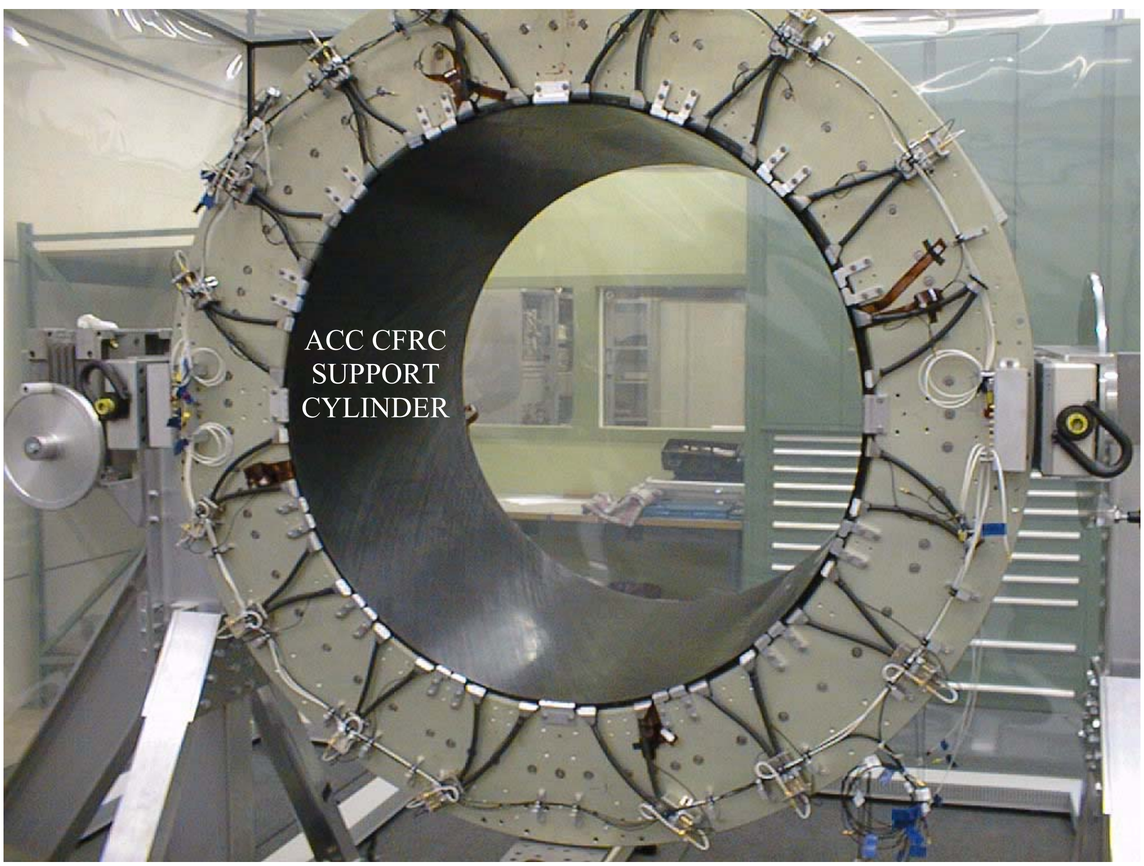

Figure 5.8-4 ACC Carbon Fiber Reinforced Composite Support Tube installed for AMS-01

The light of scintillation from particles passing through the panels are collected by 1 mm wavelength shifter fibers (Kuraray Y-11(200)M) that are embedded in groves milled into the panel surface. A panel has two collection arrays, each consisting of 37 fibers. The embedded fibers are collected into 2 output ports of 37 fibers each at both ends of the panel (Figures 5.8-2 and 5.8-5). For each panel there are two transition connectors (Figure 5.8-6), one each located on the upper and lower conical flanges of the Vacuum Case (Figure 5.8-7). From these transition connectors the light is routed through clear fibers up to PMTs mounted on the rim of the Vacuum Case (Figure 5.8-8).

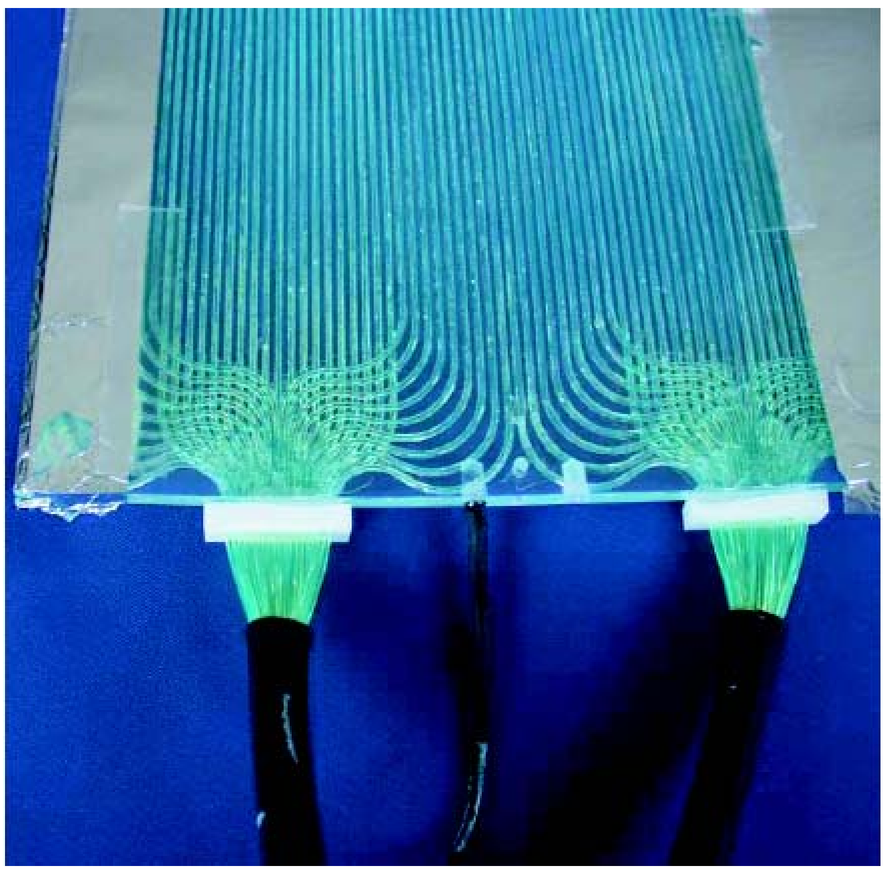

Figure 5.8-5 Fibers Collected at the End of an ACC Scintillator Panel

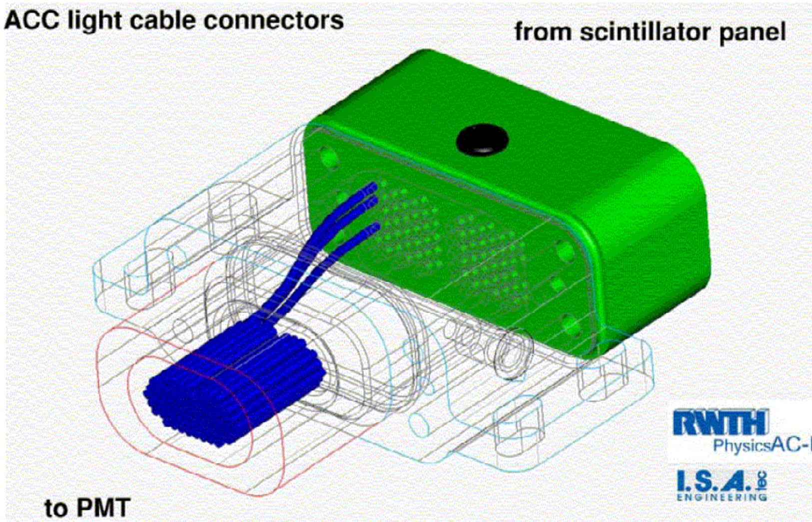

Figure 5.8-6 ACC Fiber Optic Transition Connector

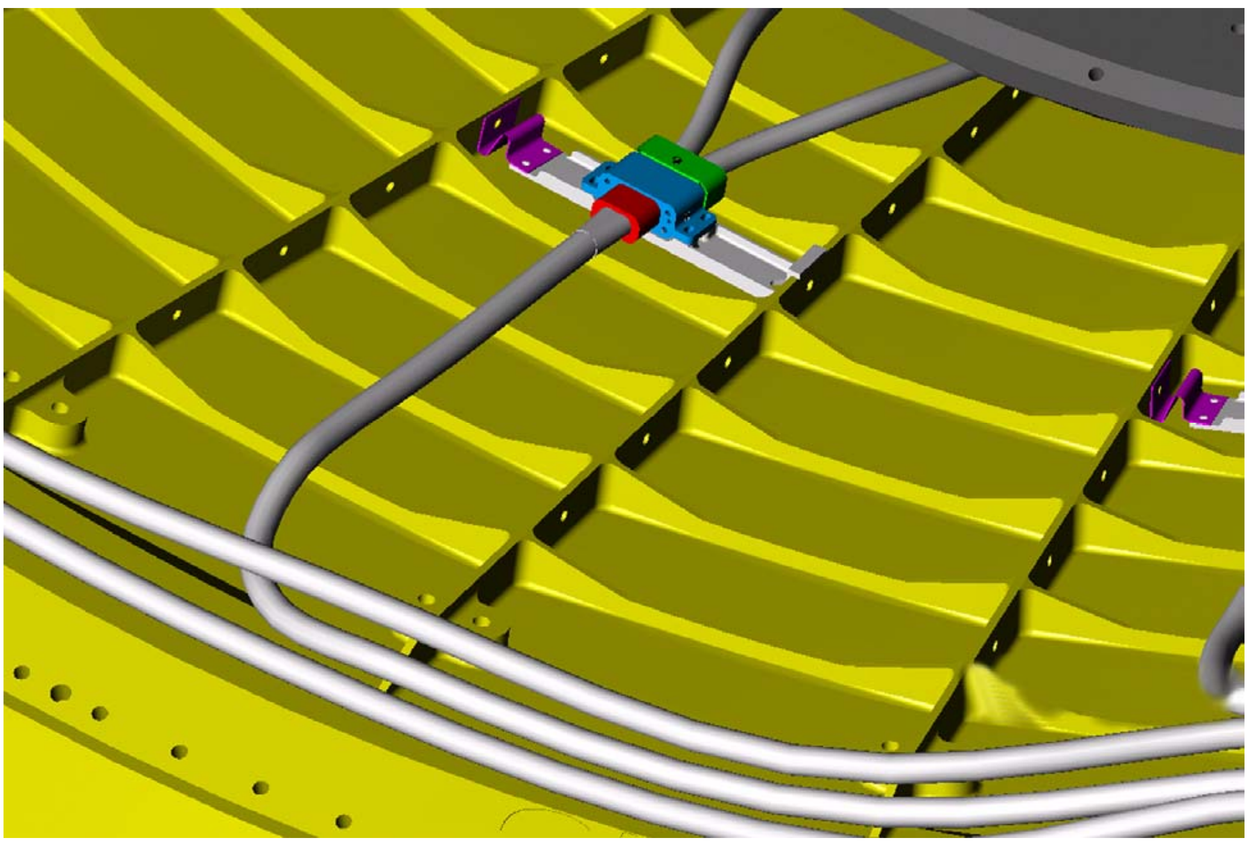

Figure 5.8-7 ACC Transition Connector Mounted to the Conical Flange

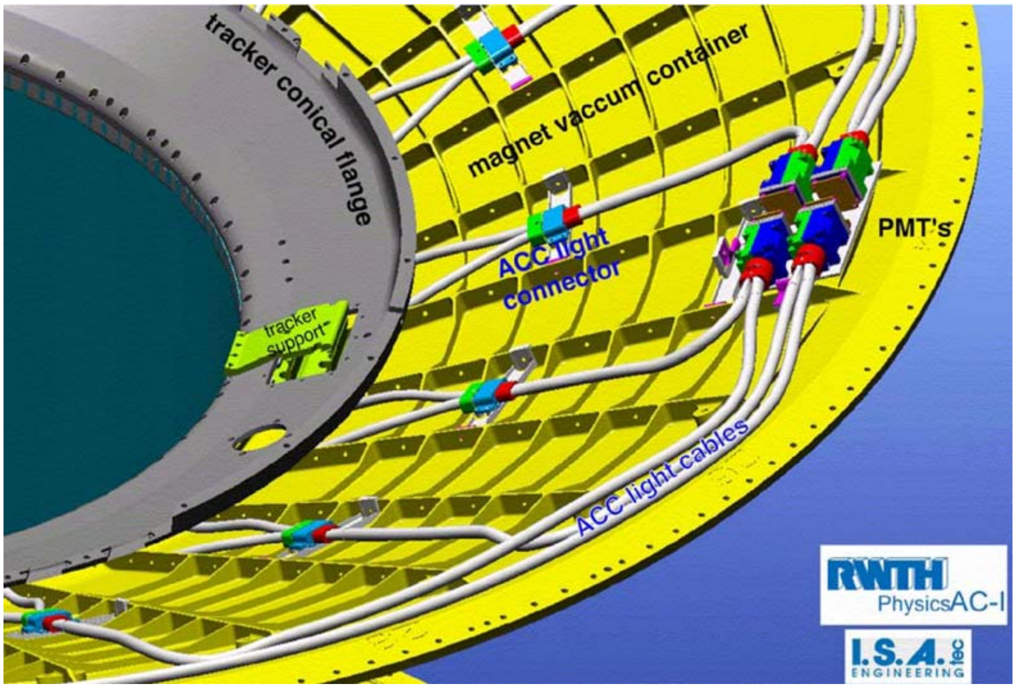

Figure 5.8-8 Routing of the Fiber Optic Cables from the ACC Scintillating Panels through the Transition Connectors to the PMTs

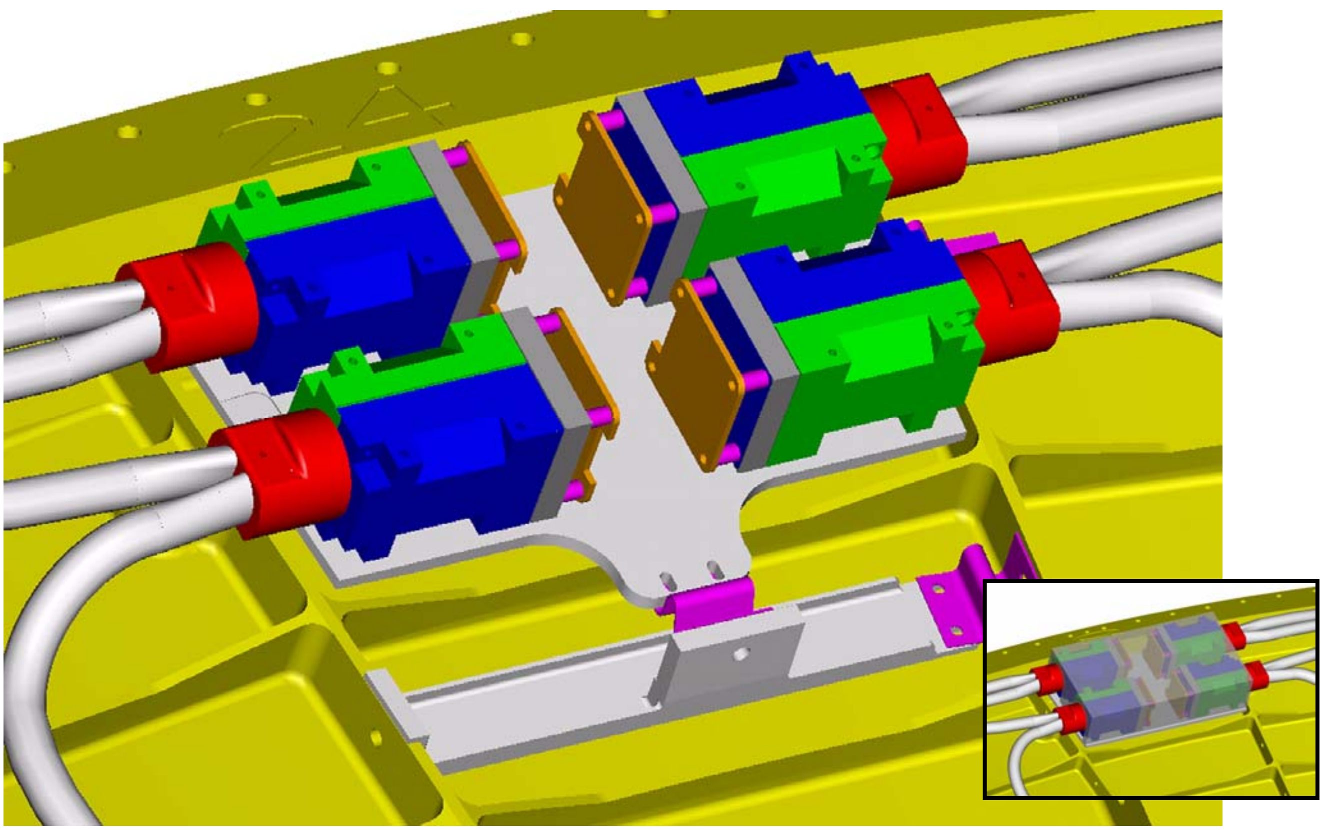

Figure 5.8-9 PMTs Mounted to the Conical Flange (Inset: PMT Set with Cover shown schematically)

The PMTs that record the light signals from the ACC panels are identical to the PMTs used in the TOF system (Hamamatsu R5946) (Figures 5.8-10 & 5.8-11). The ACC PMTs have to work in a moderate (~1.2 kG) magnetic field at locations on the top and bottom of the Vacuum Case, approximately 40 cm from the racetrack coils. To minimize the impact of this, the PMTs are oriented with their axes parallel to the stray magnetic field.

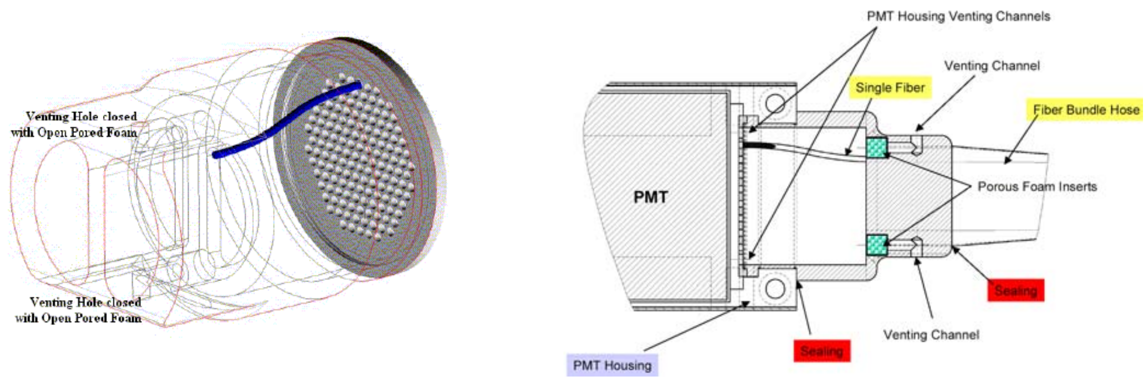

Figure 5.8-10 ACC PMT Fiber Optic Interface Construction

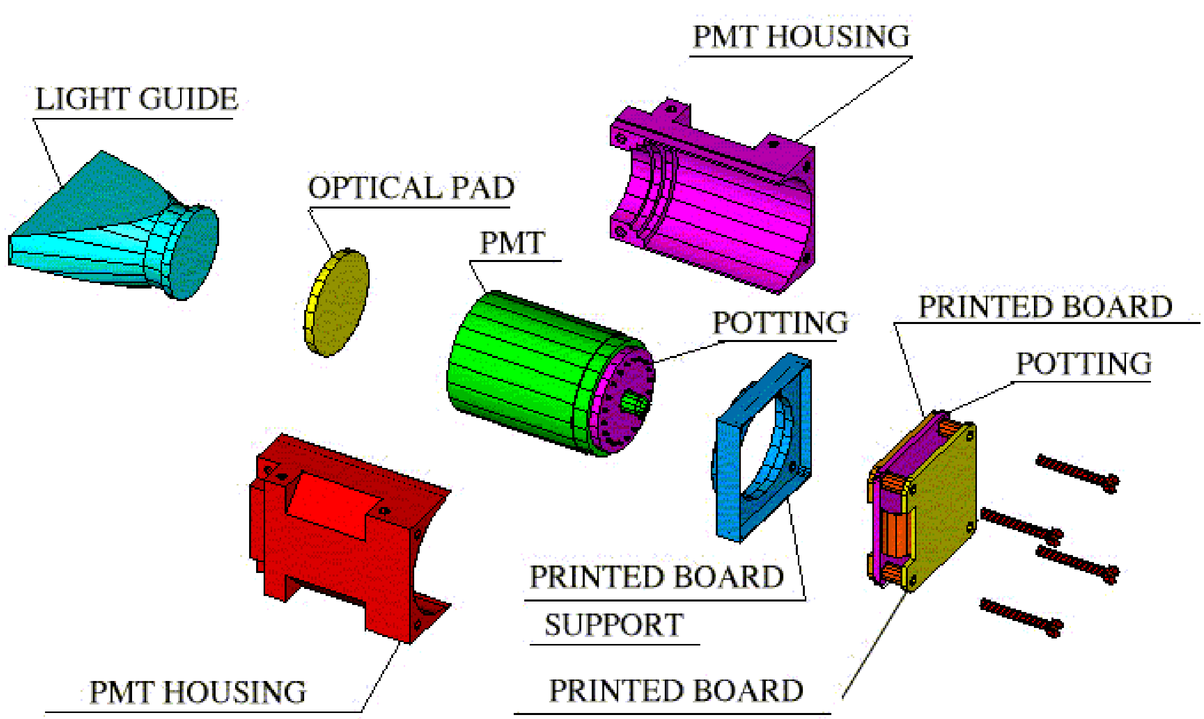

Figure 5.8-11 Basic Construction of ACC PMT is Similar to TOF Except for Fiber Optic Interface in lieu of Light Guide

The ACC also utilizes the same avionics architecture as the TOF to detect and interpret the passage of particles through the scintillating panels. Cables from the ACC PMTs are routed out from under the MLI covering the conical flanges to high voltage sources the S-Crate (Figure 5.8.12).

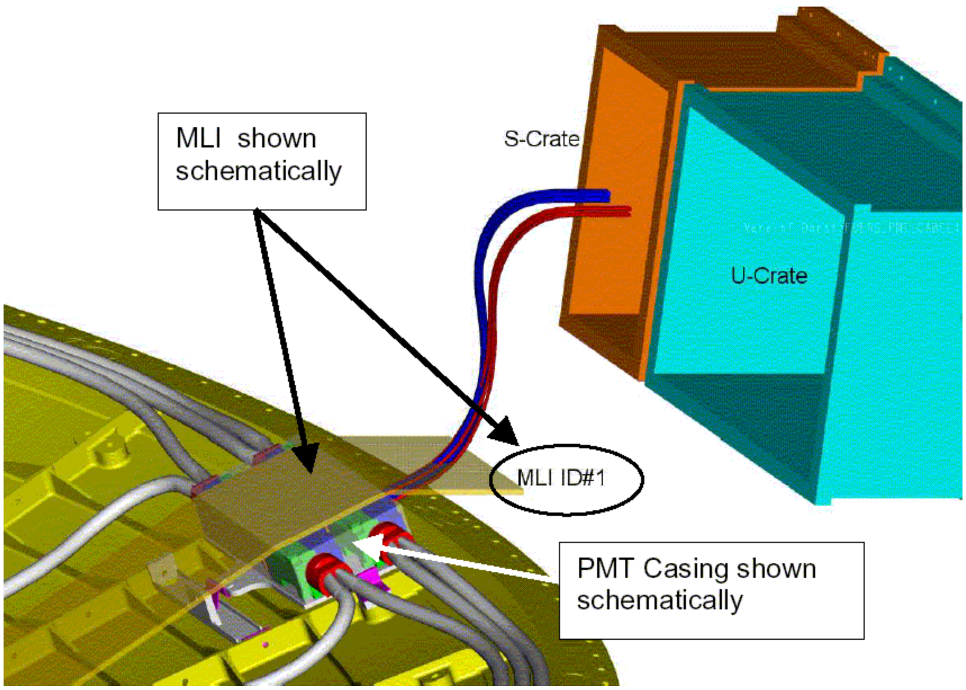

Figure 5.8-12 Wiring of the ACC PMTs to the S-Crate